NIEHS
National Institute of Environmental Health Sciences

NIEHS: Future Directions

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U.S. Department of Health and Human Services
National Institute of Health
National Institute of Environmental Health Services

National Institute of Environmental Health Sciences

- **Scientific vision**
- **Directions for growth**
- **Global environmental health**

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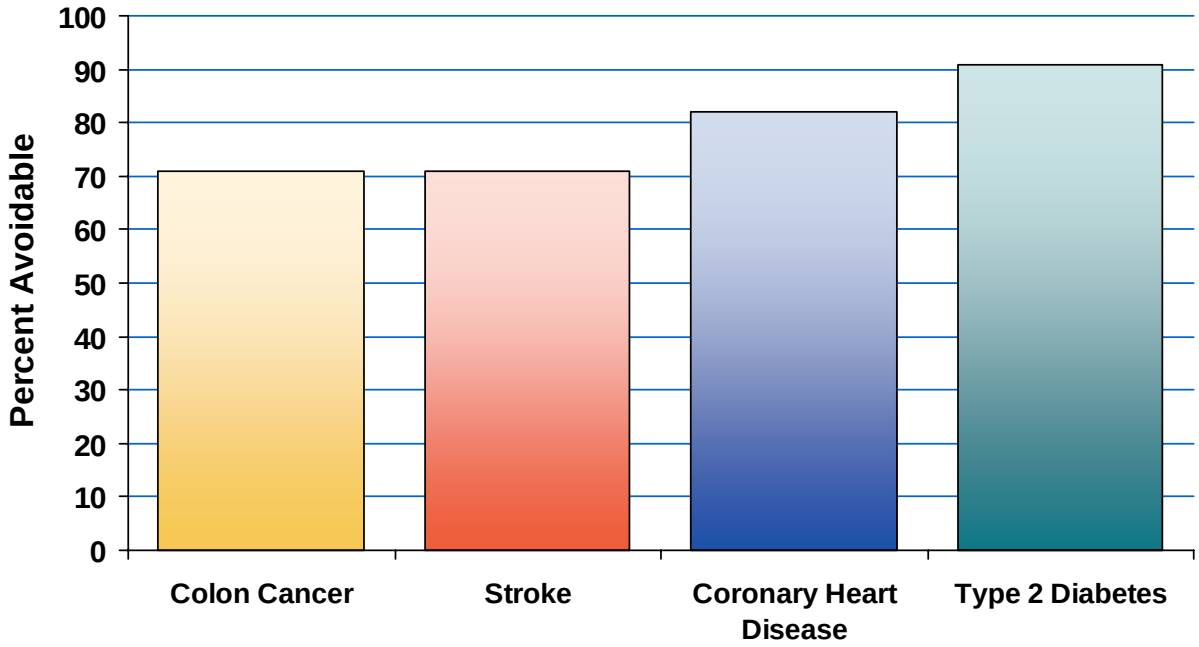
Vision for NIEHS

Use environmental sciences to understand human disease and improve human health

- Scientific orientation
- Infrastructure
- Workforce

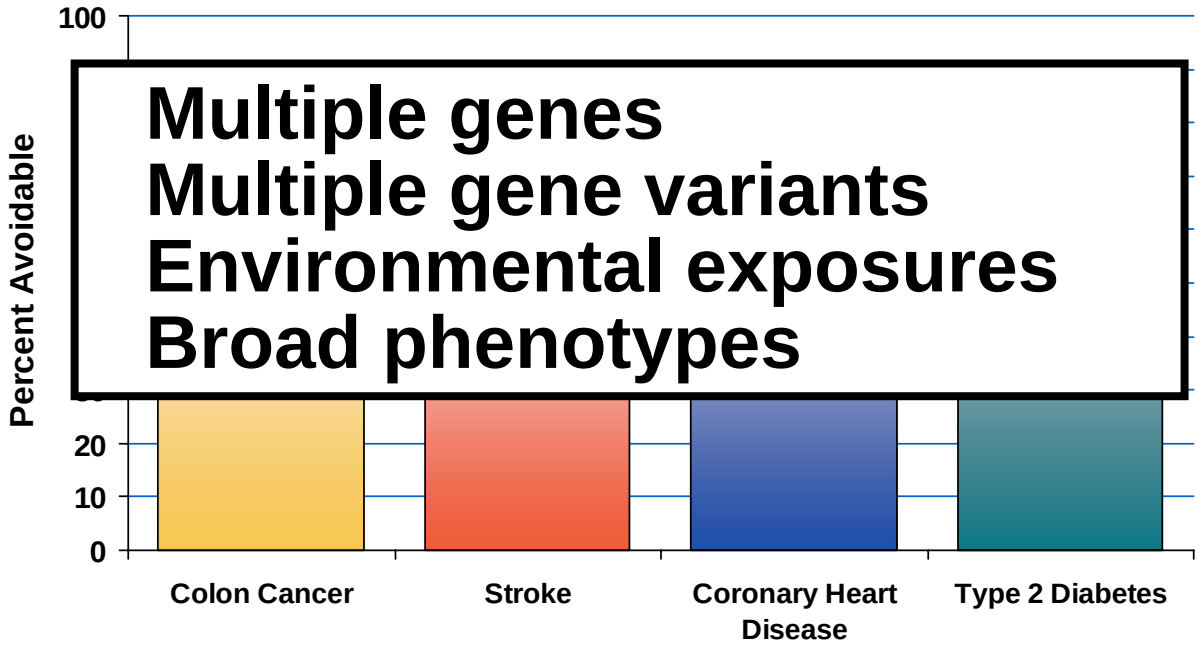
Scientific Orientation: Emphasis on Complex Human Diseases



- 70-90% of the major diseases in the USA are caused by reversible behaviors and exposures
- Single gene mutations are the major cause of cancers and CVD in < 5% of the cases

Willett. *Science* 2002; 296:695

Scientific Orientation: Emphasis on Complex Human Diseases



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Exposures Can Simplify Complex Diseases

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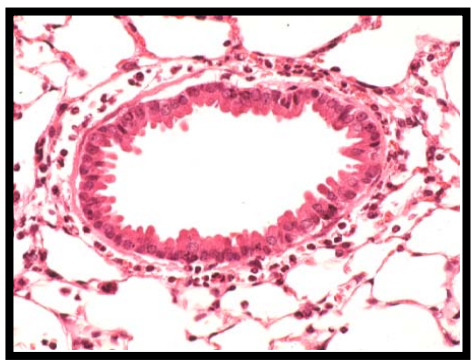
Asthma → House Dust Mite → Biological Phenotype

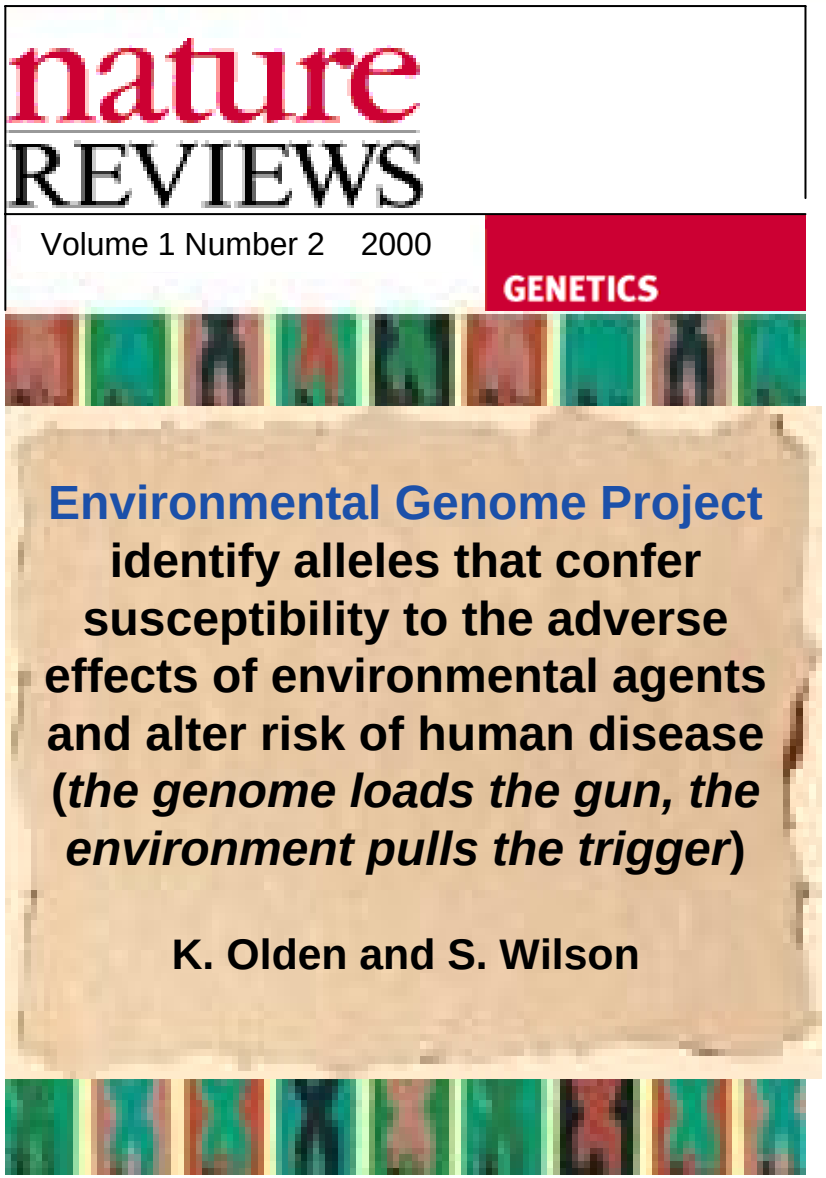
LPS



TLR4

↓ LPS asthma and atherosclerosis
↑ GN sepsis and RSV bronchiolitis

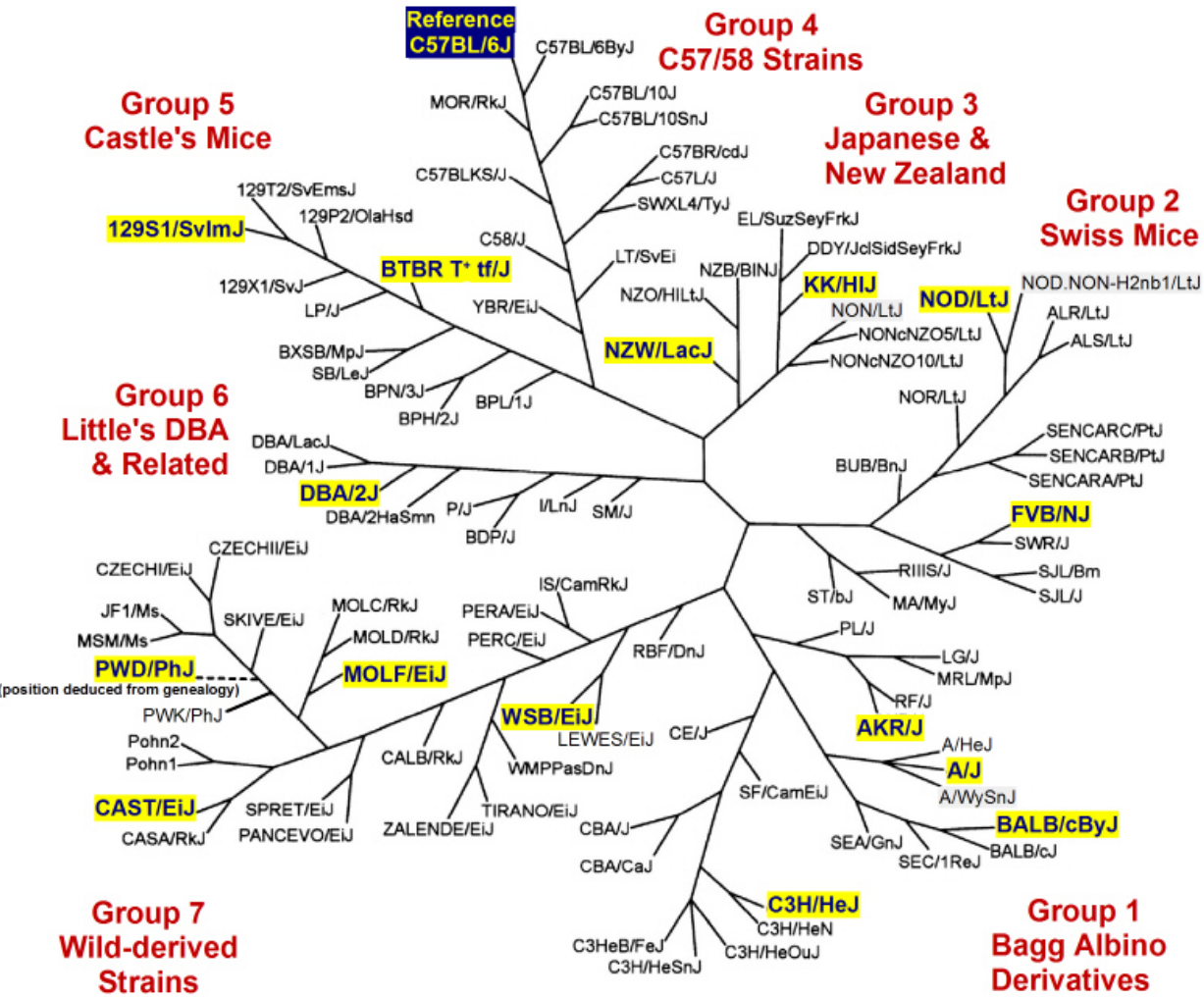
Arbour. *Nature Genetics* 2000; 25:187

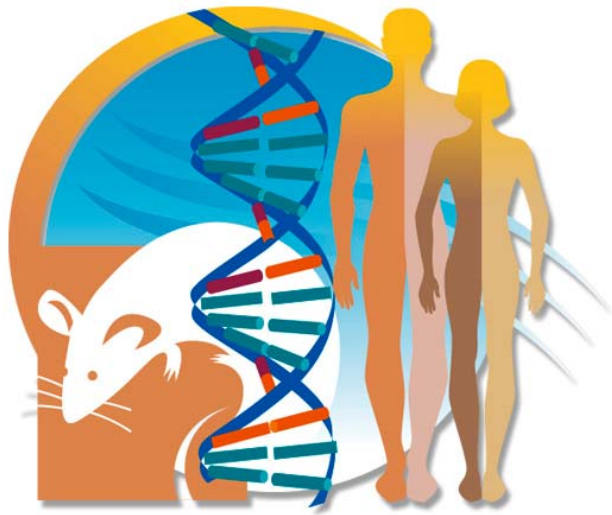


Infrastructure Accomplishments: Environmental Genomics

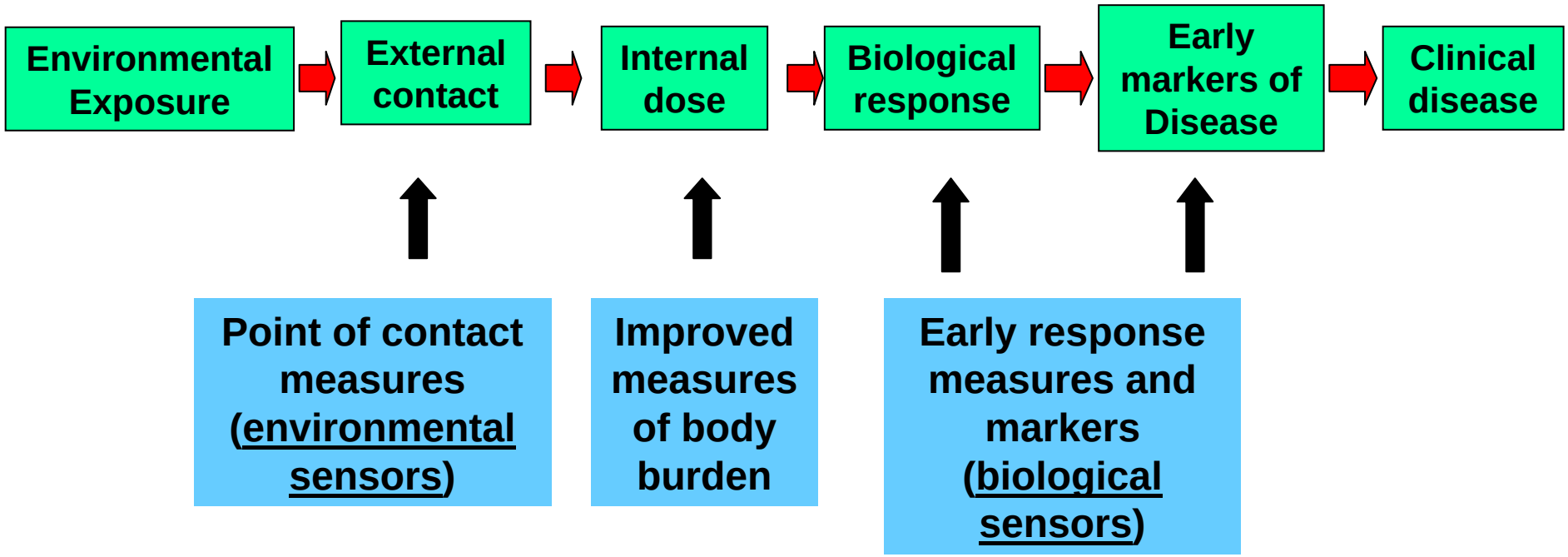
- **Re-sequenced > 500 "environmentally responsive" genes: cell cycle control, DNA repair, signaling, and metabolism from 90 individuals (www.genomie.utah.edu)**
- **Created > 50 humanized mouse strains**
- **Established standards for gene expression studies**

Infrastructure Accomplishments:
Comparative Genomics





Infrastructure Needs: More Precise Markers of Exposure



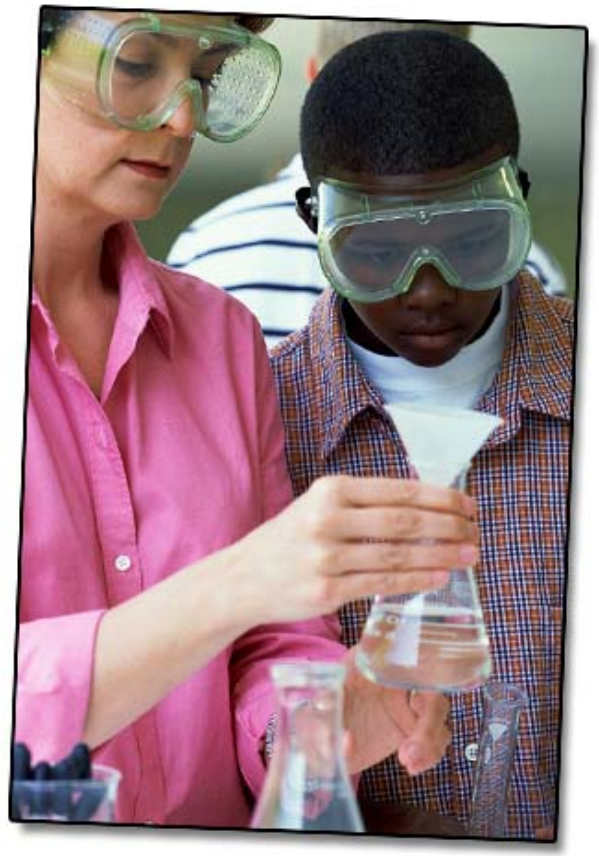
Links personal exposures to body burden to biological response

Workforce Considerations

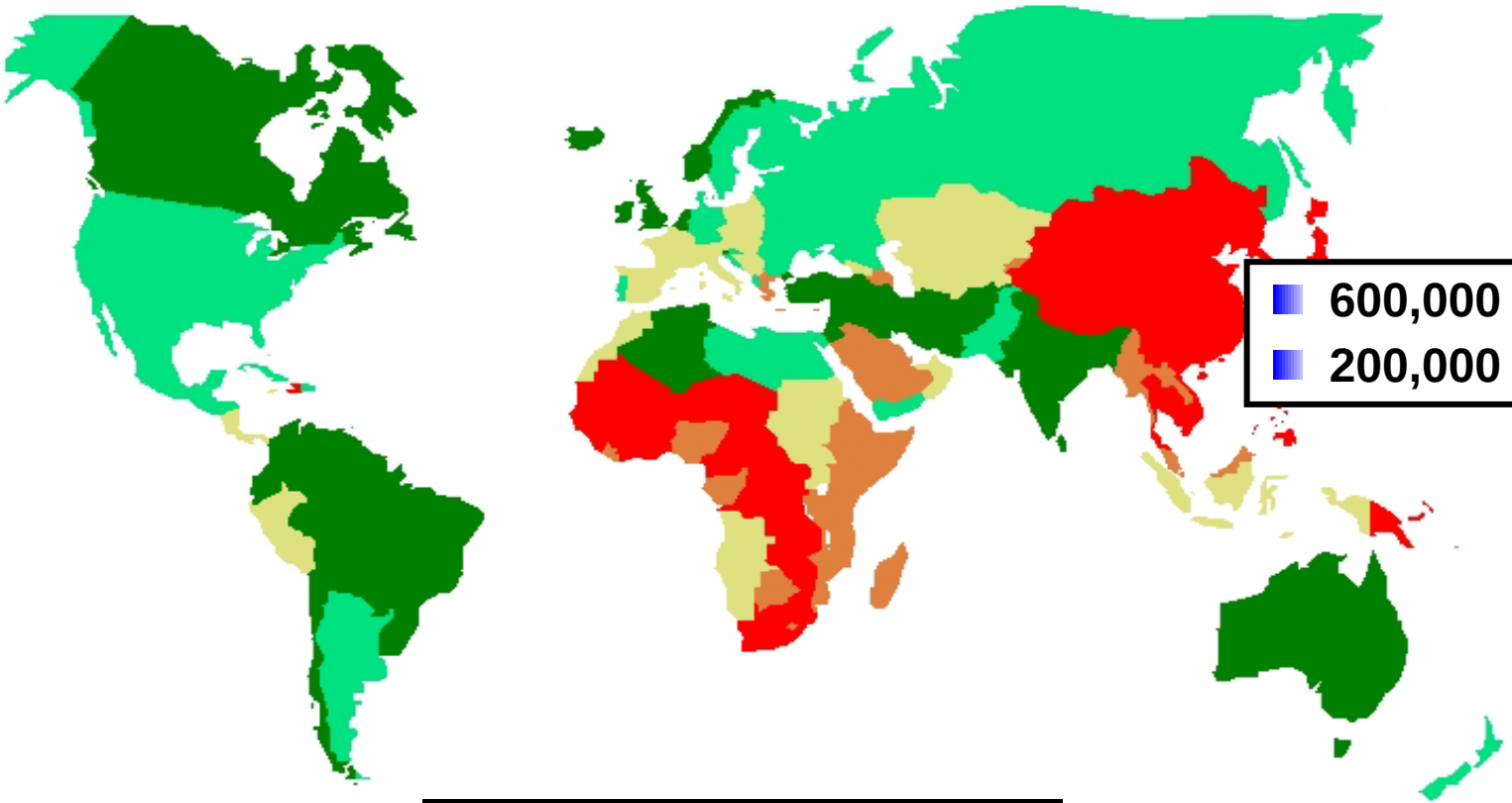
- A growing need exists to shorten the interval between research advances in biomedical science and the ability to apply these advances to improve the health of the public
- The application of lessons learned from basic science to health-related problems requires training in translational areas

Workforce: Future Directions

- Start early and support trainees through "transition periods"
- Support training with interdisciplinary teams (basic science, computational biology, medicine, and public health)
- Focus on expanding the role of physician scientists
- Consider developing short courses in environmental sciences at NIEHS



Global Environmental Health



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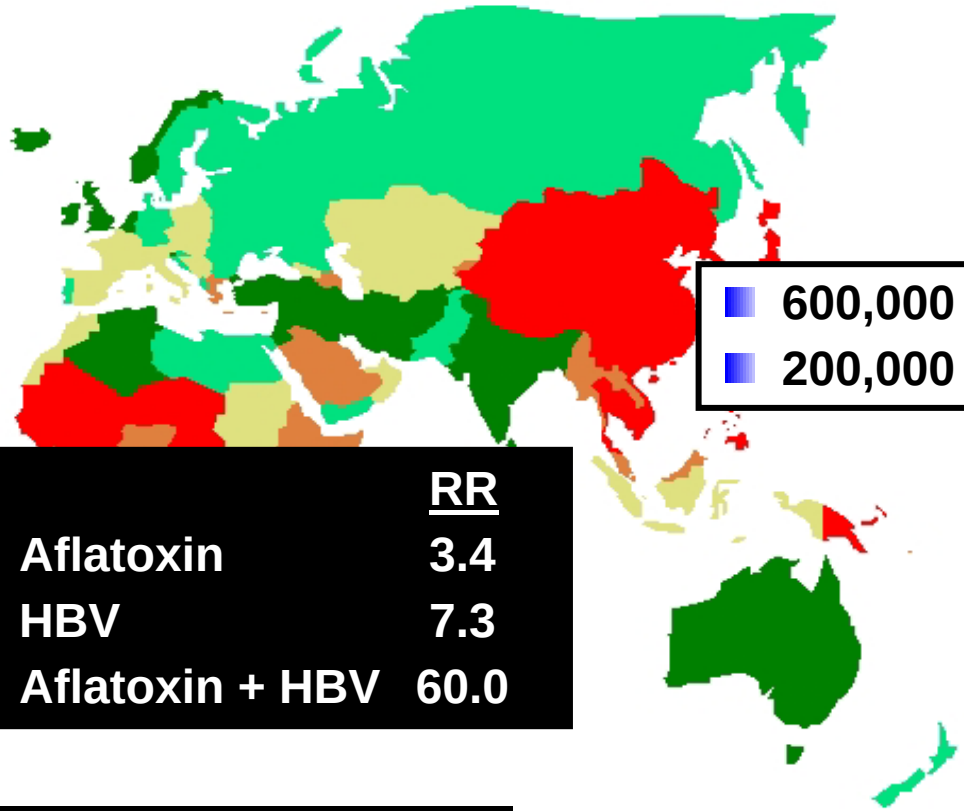

- 600,000 new cases
- 200,000 deaths

	RR
Aflatoxin	3.4
HBV	7.3
Aflatoxin + HBV	60.0

Hepatocellular Carcinoma

< 3.2 < 5.4 < 10.8 < 20.1 < 48.9

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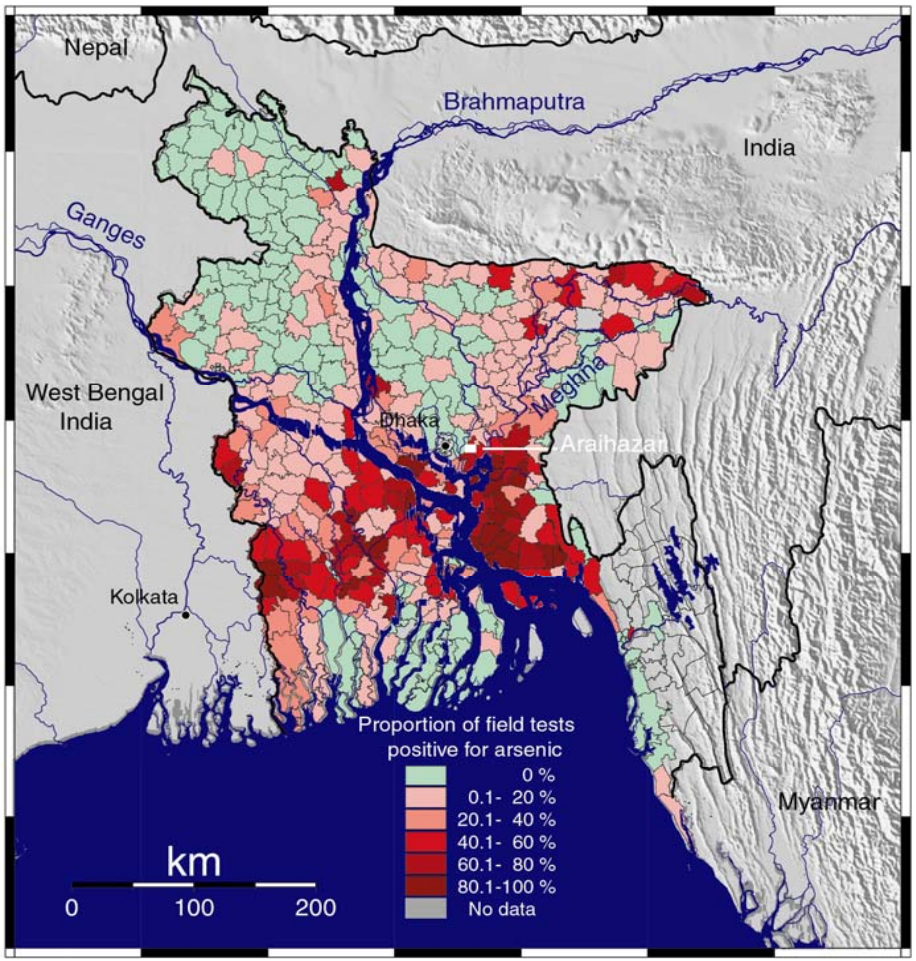
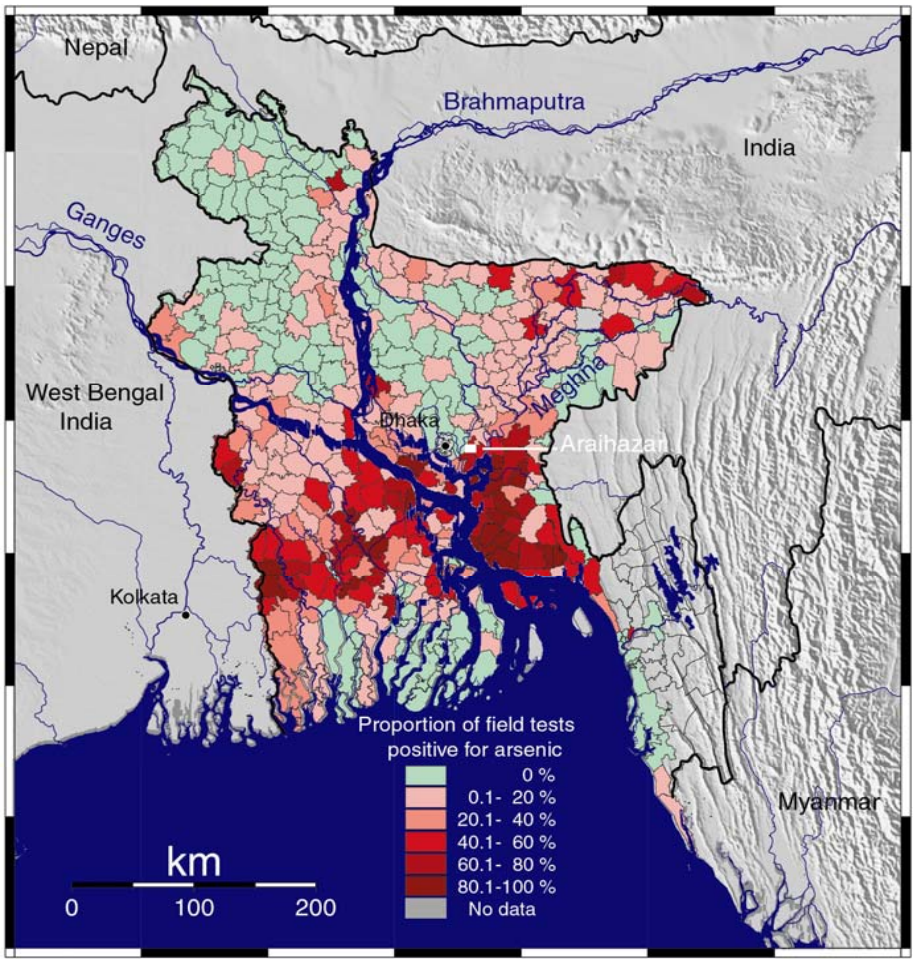
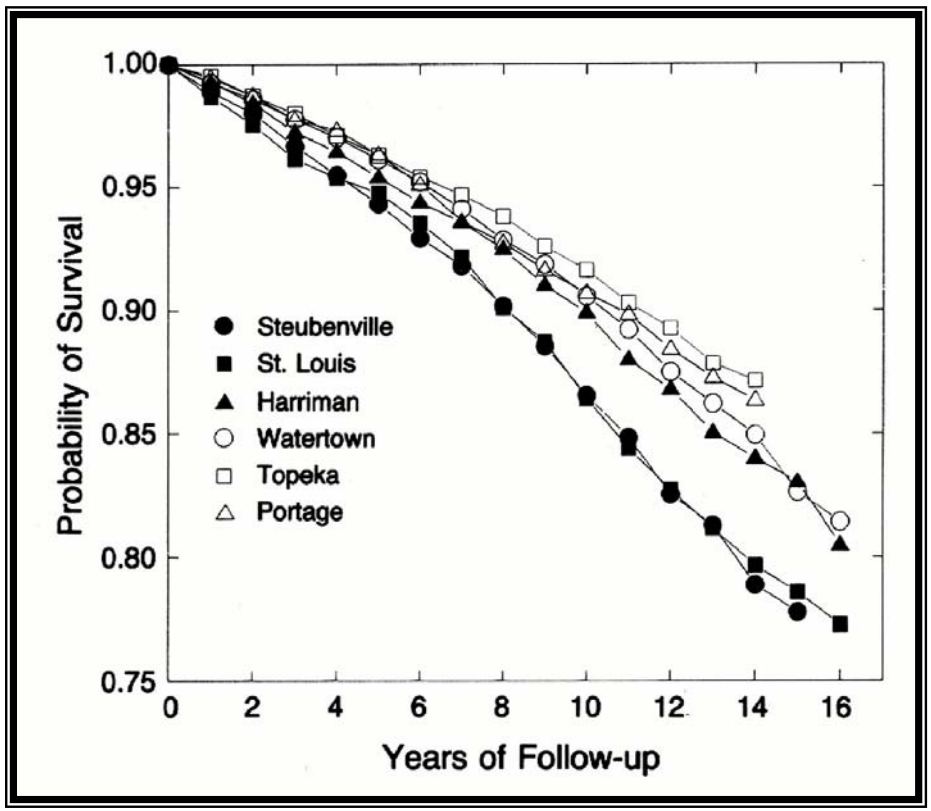


Global Environmental Health



- **Impact of environmental toxicants can be far-reaching; crossing all borders**
- **1/3 of all illnesses in the world are attributable to environmental factors**
- **Over 5 million children each year die from illnesses caused by the environment**

Global Environmental Health



Dockery. *NEJM* 1993; 329:1753

Guiding Principles for Program Development

- Best science – highest impact
- Focus on human health and disease
- Support the young investigator
- Build capacity
- Develop partnerships

Prioritizing and Program Development

- Human Health and Disease
  - Specialized Centers in Environmental Health
  - Enhance role of physician scientist
- Exposure Biology Initiative
- Environmental Genomics
  - Epigenetics
  - Comparative biology/genomics
  - Training in environmental genomics
- Global Environmental Health